TABLE 1.—*Prof. John Winthrop's record of precipitation at Cambridge, Mass., from 1750 to 1775, inclusive.*

Year.	Synopsis of rain, etc., in inches and millesimals.													Remarks.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly quantities.	Means, as they arose.	
1750....	2.355	0.708	3.894	4.063	3.651	3.076	4.235	9.464	2.145	2.721	2.084	3.835	42.231	.....	Wettest month was July, 1758.
1751....	4.143	6.944	2.573	3.222	2.486	6.734	5.2	W 9.475	4.144	3.157	3.08	1.928	53.086	47.6585	
1752....	2.077	3.056	4.808	2.646	1.263	5.341	4.934	1.826	0.875	7.122	1.878	3.066	38.392	45.56966	Order of months as to wetness at ——:
1753....	3.809	3.745	3.782	2.138	3.647	W 7.766	3.467	3.855	2.707	W 8.817	5.116	3.177	52.026	46.43375	
1754....	4.342	3.218	3.223	1.306	3.914	7.157	7.139	2.689	D 0.346	3.478	5.72	3.949	46.481	46.4432	*Dry.* *Wet.*
1755....	3.718	3.665	4.324	3.327	2.506	2.216	4.775	1.334	2.3	4.163	4.71	1.47	38.503	45.12066	September. December.
1756....	3.636	0.807	2.188	3.618	2.51	4.948	2.753	2.644	1.315	5.996	4.341	1.695	35.461	43.74071	April. November.
1757....	4.773	5.241	5.007	3.506	D 0.895	1.008	4.299	4.177	1.652	3.644	2.984	4.148	41.334	43.43987	March. June.
1758....	W 7.194	3.04	2.126	1.54	3.078	5.638	W 9.83	7.584	1.212	4.14	4.165	4.179	W 53.726	44.58277	May. August.
1759....	2.492	4.074	2.772	2.287	2.362	5.083	5.421	7.796	4.233	4.956	4.893	2.549	48.918	45.0163	February. October.
1760....	2.501	1.674	1.537	1.237	4.01	4.259	D 0.849	5.098	6.336	2.822	2.789	5.877	38.984	44.4679	January. July.
1761....	0.745	1.334	D 0.895	1.899	W 4.88	0.899	1.54	2.489	4.075	3.93	3.13	W 6.509	31.825	43.41438	
1762....	4.127	0.942	1.501	1.466	2.131	0.888	1.755	2.736	0.892	6.013	D 0.665	1.35	D 24.466	41.95715	
1763....	1.924	3.345	2.694	2.622	4.336	3.062	6.399	2.41	1.06	3.445	4.784	3.597	39.678	41.794	450.163 in 10 years.
1764....	D 0.047	3.871	1.405	4.494	1.898	1.747	6.054	2.168	4.393	3.204	3.565	4.581	36.927	41.4695	
1765....	1.918	D 0.596	2.891	4.017	2.668	2.566	2.738	7.783	1.422	3.085	3.856	3.113	32.653	40.9185	
1766....	1.749	0.938	4.032	3.737	3.187	2.405	5.848	4.373	2.772	5.324	1.641	1.726	37.732	40.73105	
1767....	3.338	1.006	5.386	2.712	2.922	1.595	6.178	1.639	5.727	2.354	5.156	4.302	42.315	40.81905	
1768....	2.792	2.069	1.476	D 1.23	2.538	3.322	4.269	4.811	5.66	3.046	2.184	4.357	36.754	40.6051	
1769....	1.989	1.753	3.563	1.868	3.08	D 0.753	4.208	D 1.033	4.333	D 1.825	5.915	D 1.078	31.393	40.1445	
1770....	4.247	3.153	1.062	1.636	4.03	3.523	1.392	8.851	3.718	5.307	3.171	1.187	41.272	40.1982	
1771....	2.557	W 6.975	W 6.298	4.17	4.073	3.91	3.03	1.768	2.19	2.484	5.669	2.186	45.31	40.4306	802.89 in 20 years.
1772....	1.75	4.383	2.059	W 4.92	2.279	1.807	3.959	6.863	W 7.648	6.63	3.555	3.022	48.875	40.79769	
1773....	2.788	1.218	2.794	2.312	2.256	1.912	2.731	2.555	2.988	4.009	1.959	5.142	32.614	40.4566	
1774....	2.461	1.887	2.631	2.807	3.877	3.285	2.165	3.922	3.175	2.46	W 6.288	2.396	37.353	40.3326	
1775....	0.857	1.056	0.991	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	

TABLE 2.—*Prof. John Winthrop's summary of his record of precipitation at Cambridge, Mass.*

	Mean quantities of rain, in inches and millesimals.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Mean quantities of 15 years	3.1922	3.01	2.8486	2.6243	2.8711	3.9876	4.5766	4.349	2.5123	4.4412	3.5936	3.461
Total of 15 years	47.883	45.164	42.729	39.371	43.067	59.816	68.65	65.245	37.685	66.619	53.904	51.91
1765	1.918	0.596	2.891	4.017	2.668	2.566	2.738	3.783	1.422	3.085	3.856	3.113
Total of 16	49.801	45.76	45.62	43.388	45.735	62.382	71.388	69.029	39.107	69.704	57.76	55.023
Means	3.1125	2.06	2.85125	2.71175	2.8585	3.8987	4.46175	4.314	2.4442	4.3565	3.61	3.438
1766	1.749	0.938	4.032	3.737	3.187	2.405	5.848	4.373	2.772	5.324	1.641	1.726
Total of 17	51.55	46.698	49.652	47.125	48.922	64.787	77.236	73.401	41.879	75.028	59.401	56.749
Means	3.0323	2.746	2.9206	2.772	2.87766	3.811	4.5433	4.3176	2.4635	4.4134	3.4942	3.3382
1767	3.338	1.006	5.386	2.712	2.922	1.575	6.178	1.639	5.727	2.354	5.156	4.302
Total of 18	54.888	47.704	55.038	49.837	51.844	66.382	83.414	75.04	47.606	77.382	64.557	61.051
Means	3.0493	2.6502	3.057	2.7686	2.8802	3.6878	4.6341	4.1688	2.6448	4.299	3.5865	3.3916
1768	2.792	2.069	1.476	1.23	2.538	3.322	4.269	3.811	5.66	3.046	2.184	4.357
Total of 19	57.68	49.773	56.514	51.067	54.382	69.704	87.683	78.851	53.266	80.428	66.741	65.408
Means	3.0353	2.6913	2.9744	2.6877	2.8622	3.6686	4.6149	4.150	2.8035	4.23905	3.5126	3.4425
1769	1.989	1.753	3.563	1.868	3.08	0.753	4.208	1.033	4.333	1.825	5.915	1.078
Total of 20	59.669	51.526	60.077	52.935	57.462	70.457	91.891	79.884	57.599	82.253	72.656	66.481
Means	2.9835	2.5763	3.0039	2.64675	2.8731	3.5228	4.5945	3.994	2.8795	4.1126	3.6325	3.32405
1770	4.247	3.153	1.062	1.636	4.03	3.523	1.392	8.851	3.713	5.307	3.171	1.187
Total of 21	63.916	54.679	61.139	54.571	61.492	73.98	93.283	88.735	61.312	87.56	75.827	67.668
Means	3.0433	2.6035	2.0114	2.5983	2.9282	3.5228	4.4425	4.2255	2.9195	4.1695	3.6107	3.22225
1771	2.557	6.975	6.298	4.17	4.073	3.91	3.03	1.768	2.19	2.484	5.669	2.186
Total of 22	66.473	61.654	67.437	58.741	65.565	77.89	95.313	90.503	63.502	90.044	81.496	69.854
Means	3.0215	2.8025	3.0653	2.6701	2.982	3.5401	4.3325	4.1136	2.8865	4.0929	3.7044	3.1752
1772	1.75	4.383	2.059	4.92	2.279	1.807	3.959	6.863	7.648	6.63	3.555	3.022
Total of 23	68.223	66.037	69.496	63.661	67.844	79.697	99.272	97.366	71.15	69.677	85.051	72.876
Means	2.96602	2.8712	3.0214	2.7678	2.9496	3.4651	4.3162	4.2333	3.0935	4.2033	3.697	3.1685
1773	2.788	1.218	2.794	2.312	2.256	1.912	2.731	2.555	2.938	4.009	1.959	5.142
Total of 24	71.011	67.255	72.29	65.973	70.1	81.609	102.003	99.921	74.088	100.686	87.01	78.018
Means	2.9588	2.8022	3.0121	2.74885	2.9208	3.4	4.2501	4.163	[page	torn]	3.6255	3.25075

a very active interest in meteorology. Franklin purchased in England an 8-foot telescope and some other instruments for Professor Winthrop, and the meager correspondence we have deals largely with these matters. In one letter from Franklin to Winthrop, appears this sentence: "I thank you much for the papers and accounts of damage done by lightning, which you have favored me with." Further than this there is nothing of strictly meteorological interest.

GOVERNMENT METEOROLOGICAL WORK IN BRAZIL.[1]

By Prof. ROBERT DEC. WARD, Harvard University.

[*Continued from the Monthly Weather Review, August, 1908.*]

THE DAILY WEATHER MAP AND FORECASTS.

The daily weather map published by the meteorological section of the Navy Department is based on observations made at Greenwich noon ($9^h\ 07^m$ a. m. Rio time) at about forty stations. Most of these are the regular stations of the Navy Department already referred to; some are under the control of the Telegraph Department (e. g., the important one at Curityba), and some are in neighboring foreign countries (e. g., Cordoba, Rosario, Buenos Ayres, Mendoza, Montevideo, and Asuncion). Several reports are missing each day. The despatches are sent by telegraph, in cipher, and include pressure, temperature, vapor tension, mean temperature of the preceding day, cloudiness, wind direction, and wind velocity. It is a serious lack not to have the amounts of precipitation during the preceding twenty-four hours given. These data would be more valuable even than the temperature and at many, if not all, of the reporting stations rain gages are already provided. The information regarding rainfall now included in the daily despatches is limited to such vague generalized statements as the following:

[1] Accompanied by Chart IX.

July 13, 1908. "It rained at São Paulo yesterday morning." "It rained during all of yesterday at Porto Alegre."

July 14, 1908. "It rained heavily at Paranagua yesterday." "At Curityba it has rained since day before yesterday."

The telegraphic despatches for the weather map are received at the central office in the Navy Department Building in Rio de Janeiro, every day between noon and 2 p. m. The map is drawn at 1:30 or 2, even if the telegrams have not all been received at that hour; it is reproduced by a mimeograph process, and copies are displayed at a few public places in Rio, and are also sent to the principal government offices. As most of the stations are immediately on the coast, the maps present a singularly incomplete appearance (see Chart IX), the isobars (usually drawn for intervals of 1 millimeter) being close together along the seaboard. At present the maps are very unsatisfactory. The forecasts relate only to Rio de Janeiro itself, and are very brief. No reference is made to temperature, as the temperature changes are slight in this region. Some of the forecasts during the writer's stay in Rio were as follows:

July 13. "Changeable weather; variable winds."

July 14. "Weather changeable from fine to unsettled; southerly winds."

July 15. "Fine weather; normal winds."

July 17. "Weather changeable; variable winds."

An examination of the maps for a week of winter weather (July 13–18, 1908) shows that for most of the coast the pressure conditions varied very little from day to day, as is to be expected, especially in the northern sections. The whole range of pressure during this period, as shown on the maps, was between 759 and 772 millimeters. A fairly heavy rain at Rio de Janeiro on July 16–18, 1908, which caused some trouble with washouts in parts of the city, furnished a good opportunity to see what general weather map features preceded and accompanied this storm.

At Rio de Janeiro the pressure rose from July 14 to 18, the noon barometer readings on these five days, as given on the daily weather map, being, respectively, 765.76, 766.38, 766.91, 769.31, and 772.26 millimeters. The writer's barograph curve showed this rise very clearly, the diurnal variation of the barometer being still fairly regular, and the reading being higher at 10 a. m. on the 18th than at any other time during two weeks spent in Rio. On July 15 the map showed a moderate and poorly-defined low, pressure 763–765 millimeters, between Florianopolis and Porto Alegre, some distance southwest of Rio, with rain at Santos that morning. Paranagua reported fresh southwest winds the preceding afternoon, with rain on the morning of the 15th (see Chart IX). On July 16 the pressure at Rio had risen, as already noted, and the low was centered somewhere to the westward of Rio, but the observations were too few to make it possible to locate the center any more definitely. At Rio the pressure had risen to 766.91 millimeters and the wind at 9:07 a. m., local time, was northwest, force 3. Santos reported rain with fresh southerly winds, and Paranagua had rain with southeast winds. The forecast for Rio was "Stormy weather, rain at intervals; southerly winds." Rain began at Rio on the afternoon of the 16th. On July 17 the low had moved somewhat north of east, and the map located it as perhaps 200 to 300 miles northwest of Rio. Santos reported rain during the 16th. The forecast was "Changeable weather; variable winds." On the 18th Rio had the highest pressure, 772.26 millimeters. The observations were too few to make it possible to say definitely what had become of the low center, but it seems probable that the storm gradually filled up and disappeared, or else past off eastward to the ocean. The forecast was for "Weather tending to improve," and on the night of the 18th it cleared off. It appears from these maps, that the rain of July 16–18 at Rio came in connection with a weak cyclonic area, and that this area did not make itself felt much nearer the equator than the latitude of Rio itself.

From the point of view of weather forecasting it appears that it would be highly desirable for the Brazilian Government (1) to increase considerably the number of stations in the southern states of Brazil, and also the number of cooperating stations in Argentina and in Uruguay; (2) to have the amounts of rainfall during the past twenty-four hours included in the daily telegraphic dispatches sent to Rio, since the amount of rainfall is more important than the temperature for most of Brazil; (3) to dispense with the daily telegraphic dispatches from the northern stations, such as Para, Natal, Pernambuco, etc., at least until there are more observers in the southern sections and in the interior. The northern States have very different weather and climatic conditions from the southern, and the critical district for forecasting purposes is that from Bahia or Victoria to the south. (4) To inaugurate a general system of weather forecasts, based on a larger number of stations, so as to include a larger area of the country, and to take up such important matters as, e. g., the prediction of frost for the coffee districts of São Paulo and other sections. It should certainly be stated in this connection that the officials of the meteorological department of the Brazilian Navy are fully awake to these needs and are doing all in their power to extend and to improve their service.

INSTRUMENTAL EQUIPMENT AT CURITYBA.

Under the control of the officials of the Telegraph Department, there are now in operation at Curityba, Quixeramobim, and Catiteté, three meteorographs, designed by Theorell and manufactured by Sörensen in Sweden, which record the principal weather elements mechanically every fifteen minutes. These instruments are reported to be working very well. The results for Curityba have recently been published. Dr. Oswald Weber,[2] the observer at Quixeramobim, has recently published the results at his station for a ten-year period. At Caiteté the meteorograph has but recently been put into operation. It is proposed to set up shortly a fourth instrument of similar pattern, on the island of Fernando Noronah, off the coast of Brazil.

The writer made a special trip in order to see the meteorograph at Curityba (lat. 25° 25′ 50″ S.; long. 49° 15′ 40″ W.), in the State of Parana. This instrument is placed in a small house on the grounds of an estate outside the city (Chacara Capanema), at an altitude of 908 meters above sea level. It is in charge of Dr. Francisco Siegel, department inspector of government telegraphs. Every quarter of an hour (96 times daily) electrical contacts are made mechanically, and the readings of the mercurial barometer (siphon pattern), wet and dry-bulb thermometers, wind direction and wind velocity are recorded in print on a roll of paper, together with the date and hour of observation. This meteorograph is a complicated piece of machinery, but the writer was assured that it does its work very satisfactorily and with great accuracy. Check readings of the instruments are made by eye several times daily. In addition to the records kept by the meteorograph, readings are made of the following instruments: rain-gages (two patterns, self-registering); Campbell-Stokes sunshine recorder; black-bulb thermometers *in vacuo*; evaporation gage (weighing); ozonometer; soil thermometers; maximum and minimum thermometers. A record of cloudiness (three times daily) is also kept. The mercurial barometer is by Sörensen of Stockholm; most of the other instruments were made by Negretti and Zambra. The exposure is fairly good, but the wind velocity is interfered with by some eucalyptus trees which are growing up near by, and it is proposed to build a new house for the meteorograph in a better location, and to move the

[2] Oswald Benno Weber. Das Observatorium erster Ordnung zu Quixeramobim. Met. Zeitsch. Apr., 1908, 25:162–167.

other instruments as well. The Telegraph Department has recently published a summary for the Curityba station, covering a period of twenty-three years, May, 1884–December, 1907, and giving very fully the results of the observations at this important place. For length and completeness of record, and importance of location, this Curityba summary easily stands first in Brazilian climatology.

THE METEOROLOGICAL SERVICE OF SAO PAULO.

The first organized meteorological service in Brazil, and one which has become well known by reason of its good work, was that inaugurated by Prof. Alberto Loefgren in the State of São Paulo in the year 1887, under the able direction of Dr. Orville A. Derby, then head of the Commissão Geographica e Geologica de São Paulo, and now chief of the Brazilian Geological and Mineralogical Service.

From the beginning of this service in 1887, when there were but two stations, the number of observers increased to nearly fifty in 1901, giving São Paulo the distinction of having the greatest number of meteorological observers in a given area of any South American country. The observers, chiefly teachers, engineers, and telegraph officials, are paid according to the order of their stations, from $8 to $12 a month, the State government having been liberal in its appropriations of money for the maintenance of the service. Observations are made at 7 a. m., 2 and 9 p. m., and about one-half of the stations are equipped with self-recording instruments.

The annual meteorological publications of the São Paulo Commission (Secção Meteorologica. Dados Climatologicos, 1887–1903) have been notable because of their completeness. The first rainfall map of São Paulo was published in the volume for 1901. In 1902 the meteorological service was reorganized under J. N. Belfort Mattos, and in 1904 the work was put under the Department of Agriculture, Commerce, and Public Works. The annual volumes for 1904 and 1905 have not yet been issued. Beginning with the year 1906 the Boletim, published quarterly, replaced the annual volume. Numbers 18–21, 1906, and Series 2a, Numbers 1–3, 1907, have appeared. These bulletins give the data for all the stations; a map for each month, showing isobars, isotherms, rainfall, cloudiness, wind, etc.; and also contain views of some of the meteorological stations. The latest Boletim (Series 2a, Number 2, 1907) contains data for thirty-seven stations. Bulletin 3 of the second series is a special publication prepared for the National Exposition at Rio de Janeiro (1908), containing an historical summary of the São Paulo meteorological service, and a brief account by J. N. Belfort Mattos, of the climatology of São Paulo, with January, July, and mean annual isobars, isotherms, rainfall, and cloudiness.[3] A daily forecast is made at the central station in the city of São Paulo for the State of São Paulo, but no map is issued. About thirty stations report daily, by telegraph, their Greenwich noon observations. This number includes several stations outside of the State of São Paulo.

THE METEOROLOGICAL SERVICE OF MINAS GERAES.

The Geographical and Geological Commission of the State of Minas Geraes has organized a meteorological service on a very much smaller scale than that of São Paulo, and has published certain Boletims on the climate of stations in that province.

This article is not concerned with publications on Brazilian meteorology and climatology other than those issued officially by Government departments, but mention may very properly be made of the numerous contributions of the late Prof. F. M. Draenert, formerly of the Agricultural College at Uberaba (Minas Geraes). His "O Clima do Brésil" (Rio de Janeiro, 1896), in reality a text-book of meteorology and climatology, is especially deserving of mention. Dr. E. L. Voss,[4] has also published an important monograph, which presents the results of observations in the State of São Paulo from 1887. References to the other publications on Brazilian climatology may be found in the bibliographies.

The writer is greatly indebted to Dr. O. A. Derby, Chief of the Mineralogical and Geological Service of Brazil, for assistance in collecting the above facts.

[3] In 1905 there was issued a previous publication by the same author, entitled Breve Noticia sobre o Clima de São Paulo.

[4] Beiträge zur Klimatologie der südlichen Staaten von Brasilien. Pet. Mitth., Ergänzungsheft 145, 1904.

NOTES FROM THE WEATHER BUREAU LIBRARY.

By C. FITZHUGH TALMAN, Librarian.

THE SAMOA OBSERVATORY.

The Royal Society of Sciences of Göttingen has just published an extensive history and description of the geophysical observatory that it has maintained at Apia, Samoa, since the summer of 1902.[1] Several charts and photographs accompany this publication. Originally established for a period of only fifteen months, chiefly with a view to obtaining seismological and magnetic observations synchronous with the observations of the German South Polar Expedition, the observatory soon proved to be so valuable that means were found to prolong its life for a further period of five years, and it now seems likely to be made a permanent institution. From the beginning the necessary funds have been provided, half by the German Imperial Government and half by the Prussian Ministry of Education. (See figs. 1 and 2.)

The work of the institution is described under four heads: Terrestrial magnetism, seismology, atmospheric electricity and meteorology. The meteorological equipment includes, besides all the ordinary self-recording instruments, a complete outfit for kite-flying, and many successful kite flights have been carried out.

The observatory is the headquarters of a network of thirty climatologocal stations in Samoa; and if the plans of its former director, Doctor Linke, are carried out, it will ultimately become the center of a system of stations extending over all the South Sea Islands from the equator to latitude 35° south.

OBSERVATIONS AT CAPE SPARTEL, MOROCCO.

The best meteorological station in Morocco is said to be that maintained in connection with Lloyd's signal station at Cape Spartel. The observations made there were first brought to the attention of the meteorological world by Prof. Theobald Fischer, in his discussion of all the available climatological data for Morocco ("Zur Klimatologie von Marokko") in Zeitschrift der Gesellschaft für Erdkunde zu Berlin, Band XXXV, 1900. The station has been in operation since January, 1894, but the results of observations, tho published in a yearly table by Lloyd's, have scarcely yet found their way into the scientific libraries. We are glad, therefore, to see a résumé of the observations for 1907 published in the September, 1908, number of Das Wetter (Berlin).

The climate of the Moroccan coast is now pretty well known, observations having been maintained for several years at Mogador, Saffi, Casablanca, Rabat, Tangier, and, as just noted, at Cape Spartel. The interior, however, with the exception of the town of Morocco (Marrakesh), remains almost wholly unknown to the climatologist.

THE MORNING ROUTINE AT A GERMAN WEATHER STATION.

Under the title "Ein Vormittag an einer Wetterdienststelle," O. Freybe, in the September number of the Das Wetter, describes in graphic detail the routine of an average morning at one of the stations of the new Public Weather Service of Germany, viz: the station at Weilburg—from the arrival of the female assistant, to begin her "hausmütterlichen Geschäfte"

[1] Ergebnisse der Arbeiten des Samoa-Observatoriums der Königlichen Gesellschaft der Wissenschaften zu Göttingen. I. Das Samoa-Observatorium, von Hermann Wagner. Berlin, 1906. (Abhandlungen der Königlichen Gesellschaft der Wissenschaften zu Göttingen. Mathematisch-physikalische Klasse. Neue Folge Band VII. Nro. 1.)